भारतीय मानक

Indian Standard

IS 6609 (Part 3) : 2023

व्यवसायिक विस्फोटकों और सहायक — परीक्षण की पद्धतियाँ

भाग 3 अधिस्फोटकों, सामान्य और अनुज्ञप्त

(पहला पुनरीक्षण)

Commercial Blasting Explosives and Accessories — Methods of Test

Part 3 Detonators, General and Permitted

(First Revision)

ICS 71.100.30

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Explosives and Pyrotechnics Sectional Committee, CHD 26

FOREWORD

This Indian Standard (Part 3) (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Explosives and Pyrotechnics Sectional Committee had been approved by the Chemical Division Council.

Testing of commercial explosives is of utmost importance for ensuring their safety during transport and handling, stability in storage and adequate life and performance under all conditions of use. Test methods included in this standard cover these aspects for all the groups of explosives under consideration.

Depending upon the origin and type of the explosives, a large number of test methods are in vogue, which though similar in nature, differ in minor details of experimental procedure and expression/interpretation of results.

It is a difficult task to select a particular method as the best. Therefore, choice has been affected in favour of those methods, for which sufficient experience and experimental data is available and which are mutually acceptable to all concerned, namely, the producers, the inspecting authorities and the consumers in the field.

The test methods prescribed in this standard cover general and permitted explosives and accessories like detonators, detonating fuses and safety fuses. They do not cover all items but include those which are currently used and manufactured in the country. The method of tests for various explosives and explosive accessories are covered under different parts of this standard:

Part 1	Gunpowder
Part 2/Sec 1	Explosives general
Part 2/Sec 2	Explosives permitted
Part 2/Sec 3	Explosives slurry
Part 4	Detonating fuses
Part 5	Safety fuses

This standard was originally published in 1973. In this revision, the following modifications have been incorporated –

a) Requirement for sand used in strength test by sand bomb method is modified;
b) Instrument to be used in electrical resistance test is modified;
c) The details of current generator for no fire current test is modified;
d) Gas incendivity test for delay and instantaneous detonators is made uniform; and
e) Coal dust incendivity test is added.

The composition of the Committee responsible for the formulation of the standard is given in Annex A.

In reporting the result of a test or analysis made in accordance with this standard, is to be rounded off, it shall be done in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’.

Indian Standard

COMMERCIAL BLASTING EXPLOSIVES AND ACCESSORIES — METHODS OF TEST

PART 3 DETONATORS, GENERAL AND PERMITTED

(First Revision)

1 SCOPE

This standard (Part 3) prescribes the methods of test for detonators, general and permitted including (a) ordinary (plain) detonators, (b) instantaneous electric detonators, and (c) delay electric detonators.

2 REFERENCES

The standards given below contain provisions which through reference in this text, constitute provisions of and necessary adjuncts to this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of these standards:

IS No.	*Title*
IS 405 (Part 1) : 1992	Lead sheets and strips — Specification: Part 1 For chemical purposes (*third revision*)
IS 460 (Part 1) : 2020	Test sieves — Specification: Part 1 Wire cloth test sieves (*fourth revision*)
IS 488 : 1980	Specification for glass making sands (*second revision*)
IS 10081 : 1981	Glossary of terms relating to commercial explosives, pyrotechnics and blasting practices

3 TERMINOLOGY

For the purpose of this standard, the terms and definitions given in IS 10081 shall apply.

4 TEST METHODS FOR DETONATORS, GENERAL

4.1 Water Resistance Test

4.1.1 *General*

The object of the water resistance test is to ensure satisfactory water-tight crimping on the detonator. Unlike plain detonators, electric detonators are very frequently used for blasting explosive charges in wet boreholes. For this reason, the sealing made by the crimping should be perfectly water-tight under field conditions of use.

4.1.2 *Apparatus*

4.1.2.1 *Water pressure test vessel* — as shown in Fig. 1.

It is provided with a lid which can be tightened with nuts and with pressure gauge to check pressure. There is an inner container to keep the detonators.

4.1.3 *Procedure*

4.1.3.1 *Storage of detonator samples under water pressure*

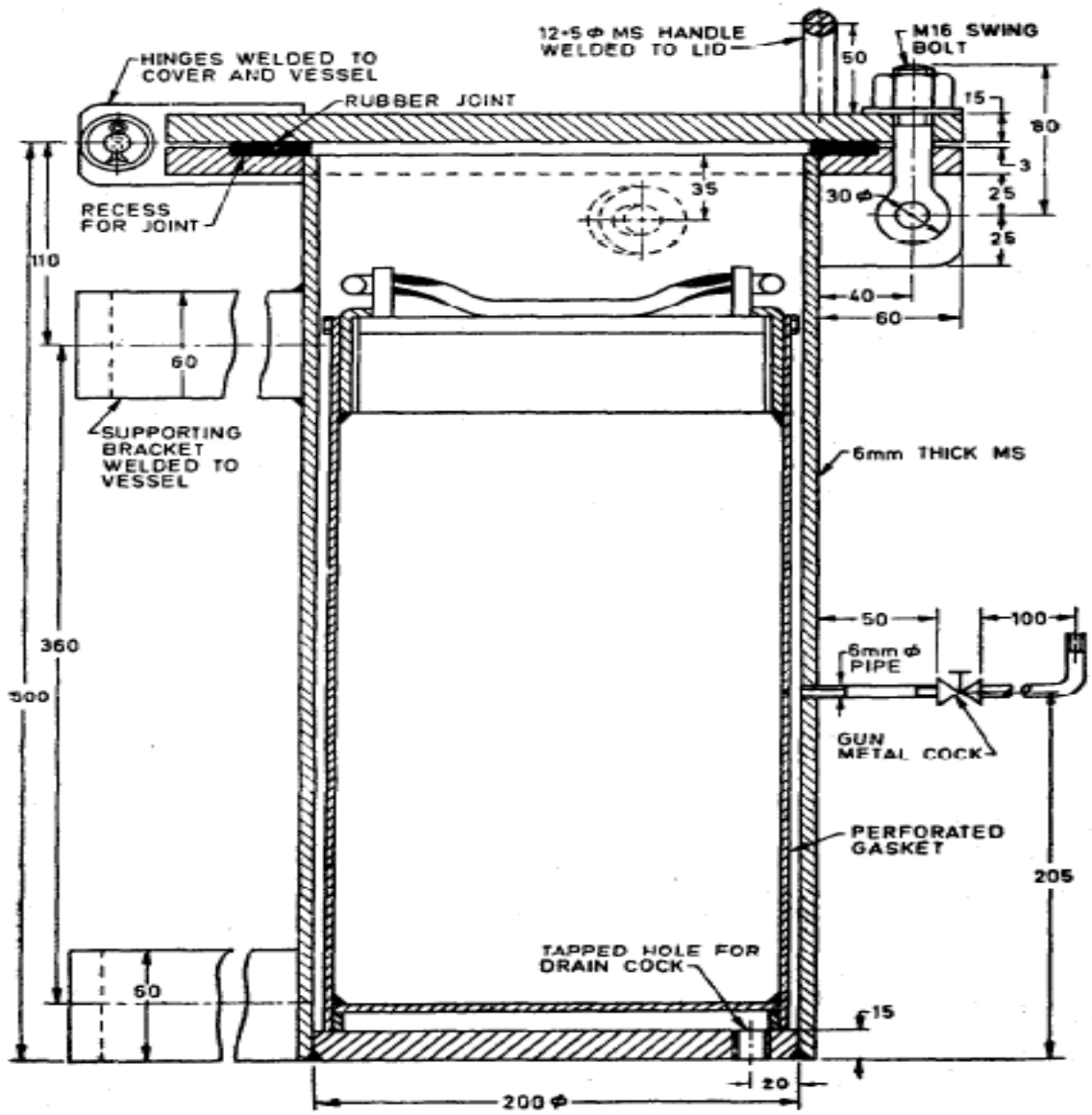
Take the samples under test and tie them in a bunch. Open the lid of water pressure test vessel, place the bunch of detonators in the inner container and fill it with water so as to cover the detonators. Close the water pressure test vessel lid and tighten the nuts.

Apply pressure of 21 N/cm^2 either by operating foot pump or compressed air line connected to the water pressure test vessel. In case the water main pressure is sufficiently high, it can be used for raising the pressure to 21 N/cm^2. Check the pressure-gauge every half an hour to ensure that the pressure is properly maintained. Keep the samples under this pressure for 2 hours.

4.1.3.2 *Firing of the samples*

After 2 hours of storage, release the pressure, open and take out the detonators. Determine the strength of the detonators by the method prescribed in **4.6**.

4.1.3.3 Record the results giving the type of the detonator, and markings on the lead plates on the basis of comparison with standard markings as in **4.6.2.1**.



All dimensions are in mm.

FIG.1 WATER PRESSURE TESTING VESSEL

4.1.4 *Precautions*

The following precautions shall be observed:

a) Do not open the test vessel unless the pressure is released;

b) In case of misfire, do not approach the detonator within 5 minutes of firing and after this, follow the recommended procedure for handling misfires; and

c) In case of partial detonation, scan the area where the detonators were being tested and carefully pick up all partly detonated explosive charges of the detonators and keep these shells for disposal or destruction by detonation.

4.2 Drop Test

4.2.1 *General*

The object of the test is to determine the insensitivity of detonators to shock.

4.2.2 *Procedure*

Cut the leading wires of the electric detonators so that 20 cm lengths are left. Drop the detonators through a pipe of not more than 40 mm diameter behind a protective wall from a height of 2 m upon a concrete slab or an iron plate so that they fall vertically with the bottoms downwards. Note down the number of detonators that have fired. Plain detonators are dropped as such.

4.2.3 *Precautions*

After dropping the detonators, wait at least for 5 minutes and then collect the shells.

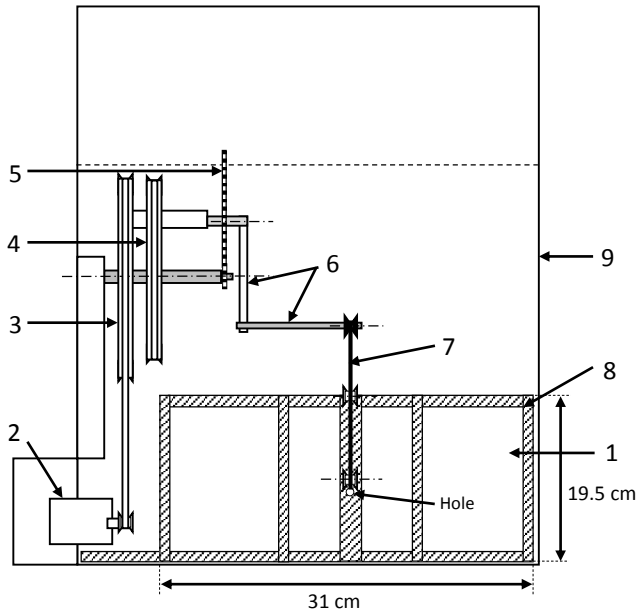
4.3 Snatch Test

4.3.1 *General*

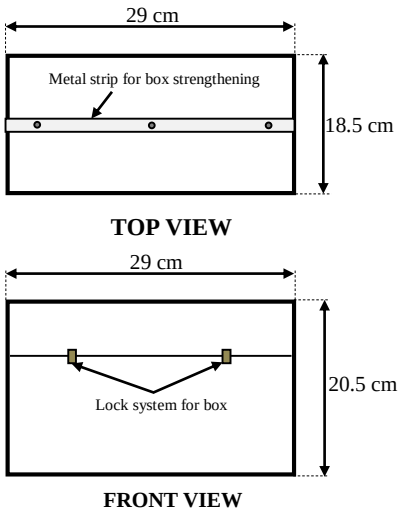
The test is applicable only to electric detonators. It is performed to judge the safety in handling the detonators to ensure that the detonators are not unduly sensitive and do not go off when subjected to severe jerk on the leading wires.

4.3.2 *Apparatus*

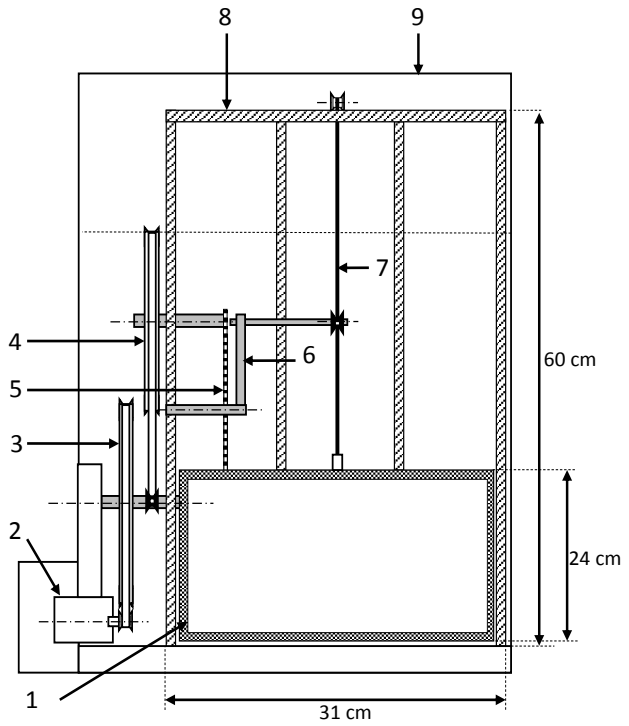
It consists of a steel box open at one end with a hole in the centre over which a collet to hold the detonator is suspended (*see* Fig. 2).



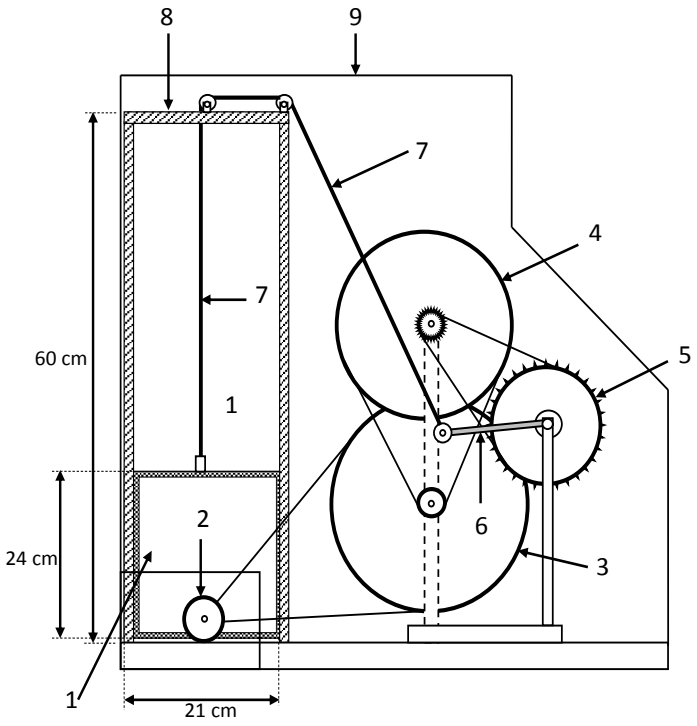
(A) TOP VIEW



Wooden Shaker Box



(B) FRONT VIEW



(C) SIDE VIEW

Key

1 Shaker box container
2 Electric motor
3 Pulley wheel (Ø 22 cm)
4 Pulley wheel (Ø 20 cm)
5 Chain Pulley wheel (Ø 8 cm)
6 Lever for wire to provide vibration
7 Wire for vibration
8 Steel frame
9 Cover frame

(D) Vibration Test Apparatus

(E) Wooden shaker box where detonators are kept for vibration test

FIG. 2 SCHEMATIC DIAGRAM OF VIBRATION TEST APPARATUS

4.3.3 *Procedure*

Cut the leading wire of the electric detonator to be tested to a length of 1 m and suspend freely while the ends of the leading wire are passed through and tied to a 5 kg weight which is kept on a platform. Keep the arrangement behind a protected shield so that the weight can fall from a height of 0.5 m and in case of an explosion nobody is endangered. The dropping of the weight shall not cause the detonator to go off.

4.3.4 *Precautions*

Five minutes after the test, collect the unexploded detonators and destroy them as usual in a safe place.

4.4 Vibration Test

4.4.1 *General*

The test is applicable to both ordinary and electric detonators. The object of the test is to see that the detonators are not unduly sensitive to the jolts received during transport and the characteristics of the detonators are not altered.

4.4.2 *Procedure*

4.4.2.1 For ordinary detonators, take 20 pieces to be tested and pack them in a suitable carton in two rows of 10 each, so that 10 of them face up and the other 10 face down. Give a suitable packing on the sides so that the detonators stand erect without getting disturbed during shaking. In case of electric detonators, take 40 pieces in a bundle and wrap them in paper. Place the detonators horizontally in the wooden box of a shaking machine so that they are not disturbed from their position (by suitable packing on the sides) and drop the box from a height of 15 cm 30 times in one minute for 5 minutes.

4.4.2.2 Ordinary detonators shall be visually examined for any loose powder. If the detonators show no loose powder; they shall be assembled with safety fuse as usual and fired on lead plates. In case of electric detonators, they shall be fired electrically over lead plates.

4.4.3 *Precautions*

The following precautions shall be observed:

a) The arrangement by which the detonators are shaken should be properly protected. In case any of the detonators go off, all the detonators will automatically go off;

b) During the conduct of the trials no person should be present in the room where the machine is situated;

c) After the shaking, 5 minutes interval should be given before the machine is approached and the detonator is taken out; and

d) If loose powder is found in the ordinary detonators the indication is that the consolidation of the explosive has not been carried out properly. The loose powder should be collected carefully on a piece of glazed paper and then destroyed either chemically or by burning.

4.5 Strength Test (by Sand Bomb Method)

4.5.1 *General*

The efficiency of a detonator in initiating an explosive is related to its brisance, in other words, to its crushing or shattering effect. The shattering effect is most easily produced on brittle bodies. Quartz sand possesses the desired qualities; it is cheap, abundant and quite uniform in character.

4.5.2 *Principle*

A stout iron bomb is used to hold the sand in which the detonator is imbedded and fired. The effect of the detonation is ascertained by sifting the sand after the explosion and by calculating from the mass of fine sand recovered, the percentage of sand that had been crushed. The procedure is same for electric as well as ordinary detonators.

4.5.3 *Apparatus* — as shown in Fig. 3.

It consists of a steel cylinder 210 mm long and 90 mm in diameter on the exterior, with a cylindrical chamber 165 mm deep and 50 mm in diameter. The bomb has a steel cover 90 mm in diameter, 22 mm thick above the edges and 24 mm thick in the central position. The central position has a diameter such that its projection section fits neatly into the mouth of the bomb. The cover has two small holes bored parallel through its vertical centre each of such diameter that a leg of the electric detonator will just pass through one of the holes. The other top steel cover, as shown in Fig. 3, has a hole bored through the vertical centre of such a diameter that the piece of burning fuse used in firing a detonator will pass through the hole with a neat fit. A suitable clamping device, as shown in the figure, keeps the cover in the position and prevents loss of sand when the detonator is fired.

4.5.4 *Material*

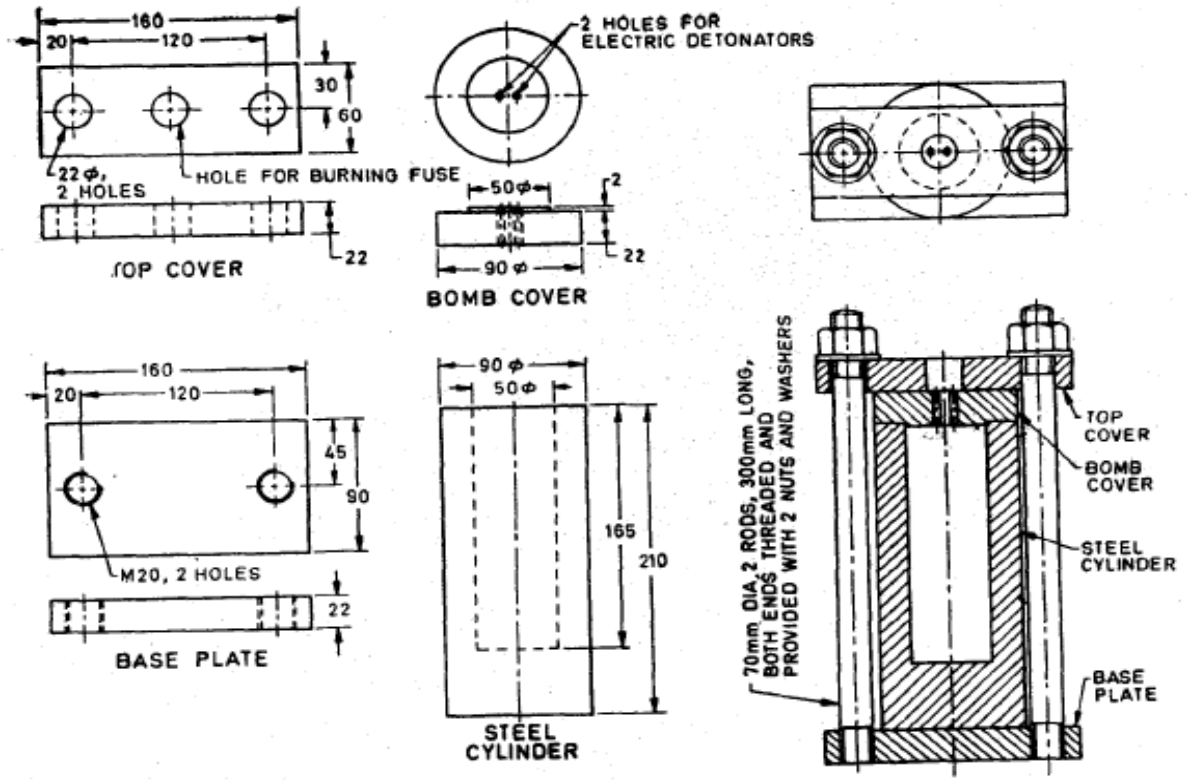
4.5.4.1 *Silica sand*

The sand shall have a minimum of 99.90 percent silica, when tested as per **C-4** of IS 488. It shall be washed thoroughly to free it from chlorides and sulphates. It shall be dried and sieved. The sand passing completely through 700-micron IS Sieve, *see* IS 460 (Part 1) and retained completely on 500-micron IS Sieve shall be used.

4.5.5 *Procedure*

4.5.5.1 Weigh 80 g of the sand and pour into the cavity of the bomb. Strike the bomb sharply few times with a light wooden hammer or jarred so that the sand gets uniformly packed. Insert the capped end of the fuse or the electric detonator carefully so that it rests on top of the sand vertically and as nearly

as possible to the centre of the cavity. Pour another 120 g of the same type of sand around the detonator in the bomb, tap the bomb mildly a few times to get the sand packed uniformly as before. Pass the end of the fuse or the detonator leading wires through the hole in the cover without disturbing the position of the detonator inside the bomb. Place the bomb within the clamping device, fix the cover tightly in position by screwing the two hexagonal nuts on the upright iron rods. Light the end of the fuse in case of plain detonator or fire the electric detonator using an exploder or a suitable firing circuit from a safe distance. (A mild clicking noise is produced by firing of the detonator inside the bomb).



All dimensions are in mm.

FIG.3 APPARATUS FOR SAND BOMB TEST

4.5.5.2 Empty out the sand carefully upon a large sheet of glazed paper, such sand as may adhere to the inside of the cavity being removed by a suitable scrapper and brush. Reject the leading wire of electric detonator or the charred fuse, also all possible fragments of the copper or aluminum shell after any adhering sand has been removed from them. Sift the entire charge of sand carefully through a nest of sieves of 500 micron, and 125 micron. The sand shall not be rubbed with the hand against the sieve. Any hard lumps shall be crushed between the fingers. Such lumps are usually found adhering tightly to the fragments of the shell of the detonator. After the screening is complete, empty out the separate fractions of the sand remaining in each sieve and in the bottom tray, on to small sheets of glazed paper and weigh.

4.5.6 *Precautions*

The following precautions shall be observed:

a) In case of testing plain detonator, about 4 cm to 5 cm of the fuse coil ends should be nipped off before use.
b) To prevent escape of sand through the holes on the cover plates while firing, the annular space between fuse or the detonator leading wires should be packed suitably, for example, using a short length of soft rubber tubing.
c) In case of misfires, wait at least for 10 minutes. Keep the misfired detonators segregated for disposal/destruction by another detonator.

4.6 Strength Test (by Lead Plate Method)

4.6.1 *General*

The strength of a detonator is its power of initiating detonation in explosives. Various tests are in use. Although the lead plate test does not furnish a quantitative estimation of initiating power, this is widely accepted as a routine test in view of its simplicity. The test consists of firing a detonator supported vertically on a lead plate of prescribed dimensions and comparing the markings/perforations produced on the lead plate with a series of standard markings/perforations.

4.6.2 *Apparatus*

4.6.2.1 *Lead plates*

The lead plates used in the test shall be 4 cm square and shall be cut from lead sheet of 5.0 mm thickness (mass 56.7 kg/m^2) conforming to lead sheet for use in chemical industry prescribed in IS 405 (Part 1).

4.6.2.2 *Firing frame*

The firing frame consists of horizontal parallel iron plates, the lowest one perforated with circular holes of 3 cm diameter over which the lead plate lies with arrangement for the detonators to be centered vertically on the lead plate and for a series of such detonators to be fired in one round.

4.6.3 *Procedure*

4.6.3.1 Place the lead plates on top of the holes on the lowermost plate. Place the detonators one on top of each plate vertically with the base of the detonator tube in good contact with the lead plate. Pass the safety fuse or the leading wires of the detonator through the two upper holes and fire the detonators following the recommended shot firing procedure.

4.6.3.2 After firing, wait at least for 5 minutes and then examine the markings produced on the lead plates and compare these with the standard markings/perforations as shown in Fig. 4. Report the results giving the type of detonator, the marking/perforation as classified in **4.6.3.3** according to the standard marking/perforation as shown in Fig. 4.

4.6.3.3 *Classification of results*

The results shall be classified as follows, according to Fig. 4:

a) *A Punched* — The plate is completely perforated by a cleanly punched circular hole. The diameter of the hole is usually least at the middle and increases towards both the faces. The metal is generally piled in a raised rim on both sides of the plate and on the underside the metal may be curled over.

b) *B Perforated* — The plate is deeply indented in a crater on its upper side and is perforated by a hole torn at the bottom of this crater. Viewed from the underside, there is a large circular area from which lead has been torn away, the perforation occupying the centre. A sub-classification is made with reference to the size of perforation at the bottom of the crater. The following figures refer to the average diameter exclusive of irregularities:

   B.1 — Perforation above 6 mm diameter.

   B.2 — Perforation between 3 mm to 6 mm diameter.

   B.3 — Perforation below 3 mm diameter.

c) *C Broken* — The appearance is similar to Class B plate except that the plate is not perforated. It has a pit on the upper side, and the underside is broken by the pressure wave giving the appearance of a shallow eruptive crater of which the rim is curled back. A sub-classification is made depending on the size of the crater.

   C.1 — Crater of more than 10 mm diameter.

   C.2 — Crater between 5 mm to 10 mm diameter.

   C.3 — Crater of less than 5 mm diameter.

d) *D Domed* — The underside of the plate is not broken but deformed by a swelling or dome corresponding in position to an indent on the upper side. A sub-classification is made depending on the size of the dome.

   D.1 — Domes of about 10 mm diameter and relatively of greater height; in extreme cases the metal may be so thinned at the top as to give perforation, but these are to be distinguished from class *B* plates by the absence of a curled back rim formation on the underside of the plate.

   D.2 — Domes of large area but low height.

   D.3 — Small domes of less than 7 mm diameter.

The sizes of the indents on the top of the plate roughly correspond to the same three subclasses.

e) *E Underformed* — There is no mark on the underside of the plate. On the upper side there may be a small indent sometimes containing the torn base of the detonator tube. There are usually no radiating striations on the lead, but there may be some embedded fragments of tube. The indent is shallow, or in extreme cases is absent. The class is subdivided into:

E.1 — Indent on upper side.

E.2 — Little or no indent on the upper side.

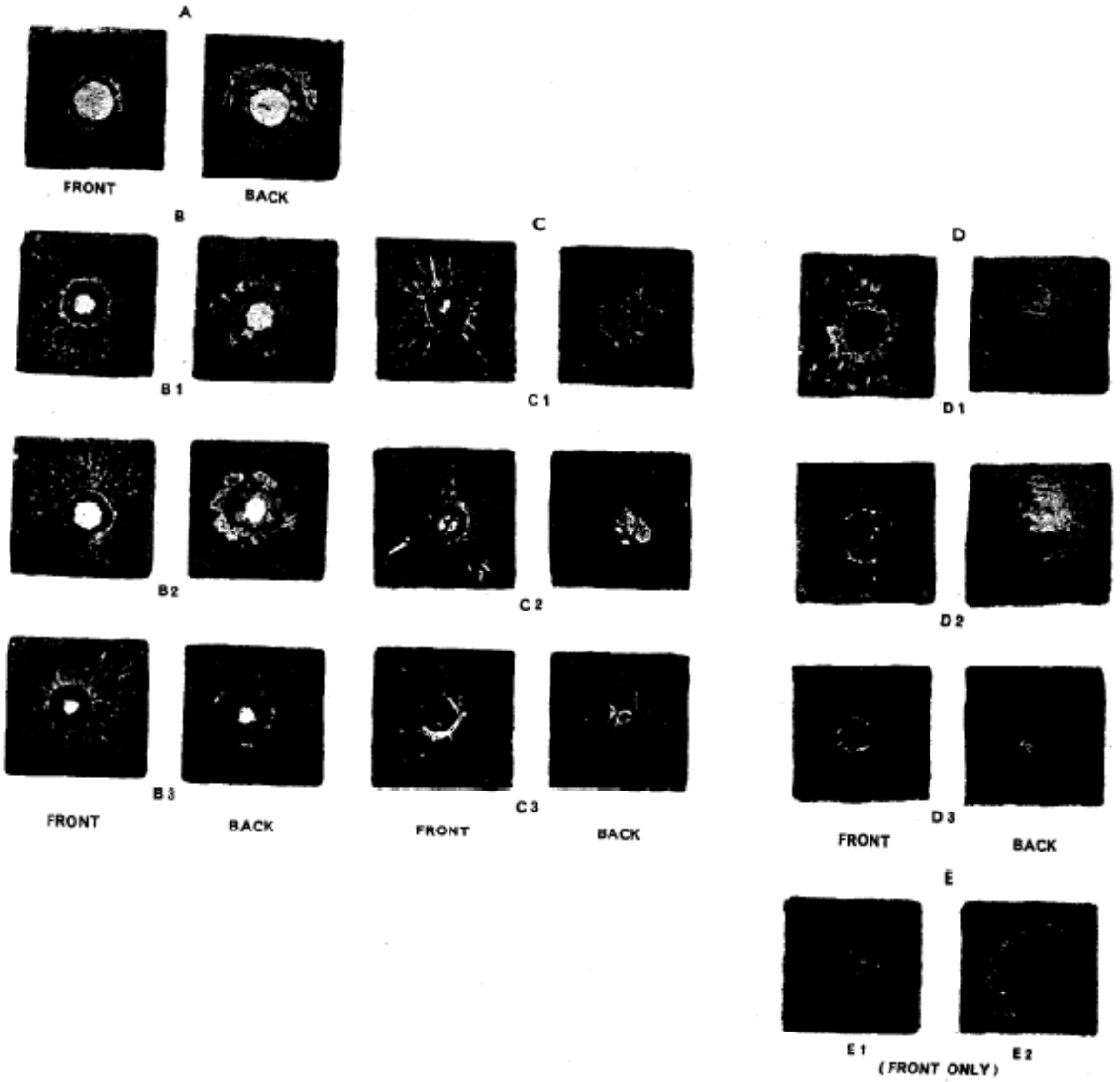


FIG.4 CLASSIFICATION OF RESULTS OF LEAD PLATE TEST OF DETONATORS

4.6.4 *Precautions*

The following precautions shall be observed:

a) While carrying out the test, ensure that the detonator is exactly vertical and placed centrally on the lead plate and making good contact with it;
b) In case of firing the detonator with safety fuse, nip off about 5 cm of the coil ends prior to inserting one end of the fuse into the detonator. Also take at least 50 cm of fuse for each test;
c) In case of misfires, wait at least for 10 minutes before approaching the misfired detonator; and
d) After the time interval specified in (c) above, dislodge the misfired detonator and destroy it by firing with another good detonator kept in contact.

4.7 Electrical Resistance Test

4.7.1 *Procedure*

4.7.1.1 Take a detonator and stretch its leading wires. Keeping the bare ends of the leading wires short-circuited, insert the detonator into a 3 mm to 4 mm thick mild steel pipe of about 25 mm diameter, connect a DGMS approved ohmmeter or equivalent instrument across the bare leading wires and measure the resistance. Record the results giving the particulars of the detonator, length of the leading wires and the resistance in ohms.

4.7.1.2 The ohmmeter or equivalent instrument shall be of such construction and design that it is not capable of firing an electric fuse head when it is connected across the terminal and current is allowed to flow through the fuse head. Also the short-circuit current of the ohmmeter/equivalent instrument shall not exceed 10 mA. It shall be calibrated to measure circuit resistance with an accuracy of at least 0.1 ohm.

4.7.2 *Precautions*

a) While carrying or handling electric detonators always keep the bare leading wires short-circuited; and

b) Prior to connecting the bare leading wires with the ohmmeter ensure that the detonator is not in line with the ohmmeter and sufficiently inside the pipe.

4.8 No Fire Current Test

4.8.1 *General*

For safety in handling, detonators are designed to withstand passage of certain amount of current without exploding. Manufacturers, therefore, specify passage of certain maximum current for a specified duration without detonation. The object of this test is to find out whether passage of the specified current for the specified duration through the detonator is safe or not.

4.8.2 *Apparatus*

4.8.2.1 *Constant d.c. current generator*

The testing apparatus shall consist of a constant d.c. current generator, a device to allow the current from the generator to flow for a specified time, and a circuit resistance measuring unit. The set-up shall have a selector switch to check the circuit resistance and also to allow the current pulse to flow through the detonator. The current generator shall be capable of giving a current of 10 mA to about 500 mA in steps of 10 mA. The instrument shall read the application time from 10 s to 500 s in steps of 10 s.

4.8.2.2 An accurate time measuring device of appropriate range.

4.8.3 *Procedure*

Take a sample of detonator of a particular make and place it inside the steel firing chamber with the leading wires connected to two terminals on the chamber. Close the chamber. Connect the firing chamber terminals with the apparatus as given in **4.8.2** using a suitable length of cable. Check the detonator firing circuit resistance, by switching the circuit resistance measuring unit. Note the resistance, switch on the current generator and timer unit. Set the current to the specified level taking into consideration of the detonator circuit resistance and the time of application of the current to the appropriate level and allow the current to flow through the detonator for the duration by operating the firing switch of the apparatus. Note whether the detonator detonates or not. Record the results, giving the type of detonator, the magnitude of current and application time as specified by the manufacturer, whether the detonator exploded or did not fire.

4.8.4 *Precautions*

Wait for 10 minutes, remove the detonator under test and repeat the test using a fresh detonator.

4.9 Minimum Series Firing Current Test

4.9.1 *General*

The test is intended to determine the minimum current at which a series of 20 detonators will fire completely.

4.9.2 *Apparatus* — same as in **4.8.2**.

4.9.3 *Procedure*

Take the number of detonators as recommended by the manufacturer for series firing, and connect them in series. Measure the circuit resistance. Compensate for the resistance of the circuit. Allow a d.c. current of appropriate strength and duration, as specified by the manufacturer of the particular type of detonators under test, to flow through the detonators. Note in the series whether fire is there or not, and record the results accordingly. In case of no

detonation of some of the detonators, increase the current strength in steps of 50 mA using a new set of detonators and determine the minimum series firing current at which all the detonators fire.

4.9.4 *Precaution*

It shall be ensured that the detonators are placed at such a distance from the instrument and the firer that no effects of the exploding detonator are caused either to the person or to the instrument.

4.10 Applications

4.10.1 *For Ordinary* (*Plain*) *Detonators*

Test methods **4.2**, **4.4** and **4.5** or **4.6** shall apply.

4.10.2 *For Instantaneous Electric Detonators*

All test methods shall apply.

4.10.3 *For Delay Electric Detonators*

All test methods shall apply and in addition, a time metering test as mentioned in **4.10.3.1** shall also apply.

4.10.3.1 Timing of any series of delay detonators shall be measured on a suitable electronic timer capable of measuring to an accuracy of ± 1 ms in case of millisecond delay detonators and ± 0.05 s in case of half-second delay detonators.

5 TEST METHODS FOR DETONATORS, PERMITTED

5.1 General

Under the coal mines regulations, only detonators which have been approved by the Directorate General of Mines Safety (DGMS) shall be used in any coal mine in which approved safety lamps are required to be used. Such detonators are termed as 'permitted' detonators and these include electric detonators for simultaneous firing, and also delay detonators.

5.2 Gas Incendivity Test

5.2.1 *General*

The test is applicable to both delay and instantaneous permitted electric detonators. It consists of firing detonators one by one in a steel lined chamber of approximate dimension 71 cm × 27 cm × 5 cm containing (9 ± 0.25) percent or (8 ± 0.25) percent of methane or natural gas-air mixture respectively, as the case may be.

5.2.2 *Apparatus*

5.2.2.1 *Multi-compartment chamber* — as shown in Fig. 5.

The chamber consists of a number of compartments connected in series by means of pipe connections. The chambers have provision for inserting detonators at the middle through threaded plugs and for introducing and circulating gas mixture. The top side of the multi-compartments is closed by polyethylene film. The chamber is placed in a room which can be made dark. A typical figure showing one compartment is also given in Fig. 5.

5.2.3 *Procedure*

5.2.3.1 Place one detonator in each compartment through the threaded plug.

5.2.3.2 Stretch a polyethylene film on the top side of the multi-compartment chamber and clamp it on to the chamber to provide gas-tight seal.

5.2.3.3 Introduce adequate quantity of methane or natural gas into the chamber and circulate to obtain a (9 ± 0.25) percent or (8 ± 0.25) percent methane or natural gas-air mixture respectively, as the case may be.

5.2.3.4 Draw a sample of the gas mixture from the chamber and check the percentage of methane using a duly calibrated methanometer.

5.2.3.5 If the gas mixture is within the specified limits, connect the detonator in parallel with the firing cables through a sequence switch.

5.2.3.6 Close all plug-cocks in the gas circulating system and fire the shots using the sequence switch and intrinsically safe firing circuit or exploder.

5.2.3.7 Observe the number of gas ignitions. Record the results giving the type of detonator, percentage of methane in the gas mixture, relative humidity of the atmosphere, number of samples tested and the number of ignitions obtained.

5.2.4 *Precautions*

5.2.4.1 In case of misfire, wait at least for 10 minutes before approaching the misfired detonator.

5.2.4.2 After the time interval specified in **5.2.4.1**, dislodge the misfired detonator and destroy it by firing it with another good detonator kept in contact.

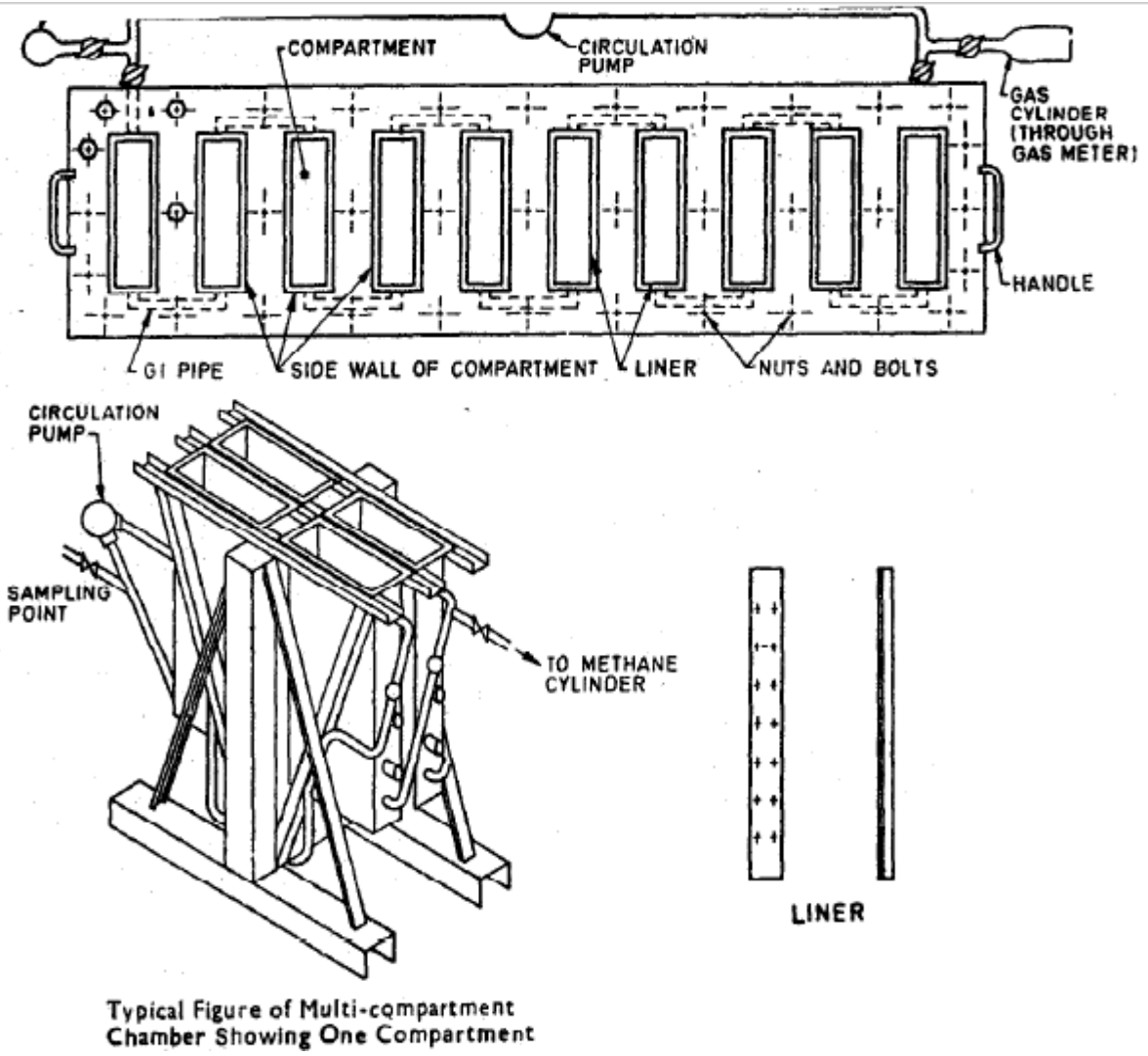


FIG.5 MULTI-COMPARTMENT CHAMBER FOR TESTING PERMITTED DELAY DETONATORS

5.3 Coal Dust Incendivity Test

5.3.1 *Apparatus and Materials*

5.3.1.1 *Chamber*

The test shall be carried out in a steel chamber measuring 970 mm × 970 mm × 610 mm. The open side of the chamber shall measure 970 mm × 970 mm.

5.3.1.2 *Coal dust* — containing approximately (40 ± 2) percent of volatile matter (calculated on an ash-free dry basis) and shall be ground to such a degree of fineness that 85 percent by mass passes through 63-micron IS Sieve.

5.3.1.3 *Paper bag* — of sufficient size to hold the detonator and coal dust.

5.3.2 *Procedure*

Fill the paper bag with 227 g of coal dust and embed a copper tube instantaneous electric detonator in the dust. Suspend the paper bag from the top of the chamber. The detonator under test shall be held horizontally in the middle of the side measuring 970 mm × 610 mm. The coal dust in the paper bag shall be dispersed by firing the detonator embedded in it and subsequently, the detonator under test shall be fired. Observe whether the coal dust ignites or not.

ANNEX A

(*Foreword*)

COMMITTEE COMPOSITION

Explosives and Pyrotechnics Sectional Committee, CHD 26

Organization	*Representative(s)*
DRDO-High Energy Materials Research Laboratory, Pune	DR A. P. DASH **(*Chairperson*)**
Arumugam Fireworks Pvt Ltd, Sivakasi	SHRI K. MARIAPPAN SHRI ARUN LALITH KUMAR (*Alternate*)
Ayyan Fireworks, Sivakasi	SHRI G. ABIRUBEN
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Central Pollution Control Board, New Delhi	SHRI ABHIJIT PATHAK
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SCIENTIST 'B'/ASSISTANT DIRETOR
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